IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANT'S MAIN BRIEF ON APPEAL

APPLICANT:	Niederdrank, et al.	DOCKET NO:	P03,0381
SERIAL NO.:	10/668,855	ART UNIT:	2615
FILED:	September 23, 2003	EXAMINER:	Lun-See Lao
CONF. NO.:	3145		

TITLE: FEEDBACK COMPENSATION FOR HEARING DEVICES WITH SYSTEM DISTANCE ESTIMATION

Mail Stop Appeal Brief-Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. §41.37, Appellant submits this Brief in support of the appeal of the above-referenced application in support of the patentability of claims 1–14 finally rejected in the Final Office Action ("OA"), dated August 24, 2007. A copy of the claims on appeal is attached as Appendix A. A Notice of Appeal was filed on November 26, 2007.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee, Siemens Audiologische Technik GmbH, a German corporation, by virtue of the Assignment recorded January 12, 2004, at reel/frame 014866 / 0474.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and no related interferences known to Appellant, Appellant's Assignee, or Appellant's legal representative.

STATUS OF CLAIMS

Claims 1–14 are on appeal, and constitute all pending claims of the application. All of these claims were rejected. The rejected claims were rejected as follows:

Claims / Section	**35 U.S.C. Sec.**	**References / Notes**
1, 5, 6, 8, 12, & 13	§102(b) Anticipation	• Williamson (U.S. Patent No. 5,091,952)
2–4 & 9–11	§103(a) Obviousness	• Williamson, et al. (U.S. Patent No. 5,091,952); and • Kates (U.S. Patent No. 6,831,986).
7, 14	§103(a) Obviousness	• Williamson, et al. (U.S. Patent No. 5,091,952); and • Wagner (U.S. Patent No. 4,845,757).

STATUS OF AMENDMENTS

Amendment A was filed on June 12, 2007, and was responsive to the non-final office action. No further amendment were filed, and this amendment serves as the basis for the Final Office Action.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter defined in each of the independent claims involved in the appeal.

1. A device for feedback compensation in hearing devices, comprising:

a signal input device 3 (Fig. 2, [0016]) configured to acquire an input signal that is influenced by a feedback;

a feedback reduction device 5, 12, 13, 14 (Figs. 2, 3, or 6, [0016], [0026–0027]) for adjustable reduction, compensation, or damping of the feedback, and

a signal output device 1 (Fig. 2, [0014]) configured to output an output signal with a reduced feedback portion; and

an estimation unit 6–11 (Fig. 2, [0016]–[0017]) that is connected between the signal input device 3 (Fig. 2) and the feedback reduction device 5, 12, 13, 14, (Figs 2, 3, or 6) and with which an estimated value of a system distance that is defined by a distance of loop gain of the feedback system to its predetermined stability limit ([0007]–[0012], [0016]) can be determined from the input signal, such that parameters of the feedback reduction device 5, 12, 13, 14 (Figs. 2, 3, or 6) are controllable using the estimated value ([0011], [0016], [0022], [0023]).

7. The device according to claim 1, wherein the feedback reduction device 6–14 (Fig. 6, [0028]) comprises at least one oscillation detector 13 and at least one narrow-band filter device 14, 15 to suppress oscillations based on the estimated value (input to notch filter control 14) [0028].

8. A method for feedback compensation in a hearing device, comprising:

acquiring an input signal 3 (Fig. 2, [0016]) that is influenced by a feedback signal;

adjustably reducing, compensating, or damping the feedback signal 5, 12, 13, 14 (Figs. 2, 3, or 6, [0016], [0026–0027]); and

outputting an output signal with a reduced feedback portion 1 (Fig. 2, [0014]) ;

estimating a system distance 6–11 (Fig. 2, [0016]–[0017]) that is defined by a distance of loop gain of the feedback system 5, 12, 13, 14, (Figs 2, 3, or 6) to its predetermined stability limit and producing an estimated value; and

controlling the reduction, compensation, or damping of the feedback signal using the estimated value ([0006]–[0008], [0011], [0016], [0022], [0023]).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues on appeal are as follows:

1. Whether the subject matter of claims 1, 5, 6, 8, 12, and 13 are anticipated by Williamson, et al. (U.S. Patent No. 5,091,952).

2. Whether the subject matter of claims 7 and 14 are obvious over the combination of Williamson and Wagner (U.S. Patent No. 4,845,757).

ARGUMENTS

ARGUMENT 1–Anticipation of claims 1, 5, 6, 8, 12, and 13 by Williamson.

Examiner's Position: Williamson anticipates independent claims 1 and 8 because it teaches each and every element of these claims..

In the OA, on pp. 2–3, the Examiner rejected independent claims 1 and 8 as being taught by Williamson. The Examiner stated, on pp. 2–3 with respect to claim 1:

> Consider claim 1 Williamson teaches a device (see fig.6) for feedback compensation in hearing devices, comprising:
>
> a signal input device (300) configured to acquire an input signal that is influenced by a feedback (acoustic feedback);
>
> a feedback reduction device (+, - sign, (309)) for adjustable reduction, compensation, or damping of the feedback, and
>
> a signal output device (304) configured to output an output signal with a reduced feedback portion; and
>
> an estimation unit (310) that is connected between the signal input device (300) and the feedback reduction device (+ -, sign, 309), and with which an estimated value of a system distance (see col. 8 line 6-9) that is defined by a distance of loop gain of the feedback system to its predetermined stability limit can be determined from the input signal (see fig.6, between output signal and speech signal (actoutic feedback) [sic] and see col. 8 line 6-9), such that parameters of the feedback reduction device are controllable using the estimated value (see col.8 line – col. 9 line 36).

On p. 3, the Examiner stated that claim 8 was essentially similar to claim 1 and applied the same reasoning for rejecting claim 8.

Appellant's Position: Williamson does not anticipate independent claims 1 and 8 because it fails to teach each and every element of these claims.

1. Williamson fails to teach or suggest all limitations of independent claims 1 and 8 in the application, including, at least, a failure to teach that the feedback compensation is performed in dependence on the system distance of the loop gain of the feedback system to a stability limit. Williamson simply teaches the modeling for estimating the feedback signal is performed by a pure delay function carried out on the output signal.

Claim 1 comprises an element related to an estimation unit that reads:

> an estimation unit that is connected between the signal input device and the feedback reduction device,
>
> and with which an estimated value of a system distance that is defined by
>
> a distance of loop gain of the feedback system to its predetermined stability limit can be determined from the input signal,
>
> such that parameters of the feedback reduction device are controllable using the estimated value.

The Examiner equated, on pp. 2–3 of the OA, Williamson's filter estimator 310 (Figure 6) with the claimed estimation unit. The Examiner read Williamson's filter 309 and the adder at the output of the filter 309 on the claimed feedback reduction device.

The Examiner then indicated that Williamson discloses an estimated value of a system distance at 8:6–9, that is defined by a distance of loop gain of the feedback system to its predetermined stability limit, and that can be determined from the input signal (citing to Figure 6, the top line labeled Acoustic feedback) and referring again to Williamson's disclosure at 8:6–9.

Williamson states, at the cited section:

> The transfer function of the acoustic feedback is modeled as a pure delay function 308 (to compensate for the time it takes for the acoustic signal to travel from the hearing aid output to the microphone input)

> and a linear filter 309 (to compensate for the frequency shaping imposed by the acoustic environment).

Appellants do not disagree that Williamson teaches an estimation unit connected between the signal input device and the feedback reduction device (filter) and that it sends information for controlling the filter to the filter. Williamson teaches a feedback reduction system in which the acoustic feedback is estimated, the parameters of a filter are set depending on a compensated signal y(t) and a feedback estimation signal z(t).

However, the modeling for estimating the feedback signal is performed by a pure delay function 308 carried out on the output signal w(t).

In contrast to this, the feedback compensation of the present invention is performed in dependence on the system distance of the loop gain of the feedback system to a stability limit. That is, the compensation depends on a value which defines the acoustic stability of the system. Instability, however, leads to undesired artifacts (see paragraph [0003] of the Specification).

Also, since feedback compensation systems lead to artifacts, such feedback compensation systems are only be activated when necessary. This necessity can be estimated with the system distance to the stability limit. For example, a feedback might be acceptable if the amplification of the signal processing is low. The same feedback might be unacceptable when the signal processing amplification is much higher, so that howling appears. Such discrimination cannot be provided by Williamson automatically.

Looking to the language required by claims 1 and 8, the Examiner alleges that Williamson discloses estimating the value of a system distance with the delay function 308. However, the delay function leads to an estimated feedback, but not to the distance as expressly required by claims 1 and 8 as the "distance of loop gain of the feedback system to its predetermined stability limit".

Furthermore, as required by claims 1 and 8, the distance is determined from the input signal. This is not the case in the system of Williamson, where the estimated feedback is obtained from the output signal w(t) and the filter

parameters are estimated on the basis of the compensated signal y(t). The feedback reduction device in Williamson is not controlled on the basis of the uncompensated input signal x(t) as required by claims 1 and 8 of the present application.

Williamson makes no mention of either:

1) a predetermined stability limit; or

2) a loop gain of its feedback system

Nor does it disclose concepts that are equivalent to these claimed features.

Since claim 8 contains elements corresponding to the elements of claim 1, as noted by the Examiner, the above arguments apply to claim 8.

Since Williamson lacks a teaching of all elements required by claims 1 and 8, applicants respectfully assert that claims 1 and 8, and all claims that depend therefrom, are not anticipated by Williamson.

Appellants do not separately argue the rejection of claims 5, 6, 12, and 13, but rather rely upon their dependence from claims 1 and 8 respectively.

Rejection of Claims 2–4 and 9–11 as Obvious over Williamson in view of Kates

Appellants do not separately argue the rejection of claims 2–4 and 9–11 in view of the combination of Williamson in view of Kates, but rather rely upon the above arguments with respect to the teaching of Williamson. Appellants note that the teaching of Kates does not serve to fill the lack of teaching with regard to Williamson as applied to claim 1, but rather was cited by the Examiner as disclosing aspects related to the dependent claims.

ARGUMENT 2–Obviousness of claims 7 and 14 over Williamson in view of Wagner

Examiner's Position: The addition of Wagner to Williamson obviates claim 7 because Wagner teaches the further limitation of claim 7 and it would be obvious to combine Wagner into Williamson to improve the voice signal.

In the OA, on p. 5, the Examiner rejected claims 7 and 14 that depend from claims 1 and 8 respectively as being obvious over the combination of Williamson in view of Wagner.

The Examiner noted that Williamson fails to teach that the feedback reduction device comprises at least one oscillation detector and at least one narrow-band filter device to suppress oscillations based on the estimated value.

The Examiner then notes:

> However, Wagner teaches that the feedback reduction device (see fig. 1 (4)) comprises at least one oscillation detector (6) and at least one narrow-band filter device (8 and see col. 6, line 7–23) to suppress oscillations based on the estimated value (see col. 2 line 66 – col. 3 line 45).
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Wagner into Williamson to improve the voice signal.

Appellants' Position: The combination of Wagner to Williamson does not teach or suggest use of the oscillation detector and the narrow-band filter to suppress oscillations <u>based on the estimated value.</u>

The Examiner added the Wagner reference to Williamson to provide an obviating combination with regard to the additional claim 7 limitation wherein the feedback reduction device comprises at least one oscillation detector and one narrow-band filter device to suppress oscillations based on the estimated value.

Appellants do not disagree with the characterization that Wagner teaches the presence of on oscillation recognition circuit 6 with an oscillation modifying circuit 8 that could include a bandpass filter (6:7–9) in an acoustic feedback oscillation suppressing circuit, but do disagree that this circuit suppresses oscillations based on the estimated value, as identified in claim 1.

As can be seen by Figure 6 of the present invention, the notch filter control 14 receives its input both from the feedback/oscillation detector 13, as well as from the evaluation unit/comparator 11 (line labeled "system distance"). Thus, the estimated value is used as a basis for suppressing the oscillation.

In Wagner, an estimated value is not used by the oscillation suppressing circuit, but rather the input to the oscillation suppressing circuit is taken from point S2 (Figure 1, and 3:20–21) which does not comprise an estimated value, but rather is taken directly from the output of the non-inverting final amplifier 3. This does not teach or suggest the use of the estimation signal for operation of the oscillation suppressing circuit, contrary to the indication of the Examiner. There are numerous configurations possible for an oscillation suppressing circuit, and the Examiner has applied hindsight reasoning to suggest that one motivated to improve the voice signal would obviously utilize the estimated value in operation of the oscillation suppression circuit when many other potential implementations are possible, particularly in light of the fact that the claimed estimation value is inventive in and of itself for reasons noted under Argument 1 above.

Appellants rely on the above arguments with regard to method claim 14.

For the above reasons, Appellants respectfully contend that the present invention is not obvious in light of any combination of Williamson, Kates, and Wagner as cited in the Final Office Action.

CONCLUSION

For the above reasons, Appellants respectfully submits that the Examiner is in error in law and in fact in rejecting claims 1–14 based on the teachings of the above-discussed references. Reversal of the rejection of all of those claims is justified, and the same is respectfully requested.

This Brief is accompanied by a check in the amount of $510.00, as required by 37 C.F.R. §41.20(b)(2). If necessary, the Commissioner is hereby authorized to charge any additional fees which may be required to account No. 501519.

Respectfully submitted,

/Mark Bergner/ (Reg. No. 45,877)

Mark Bergner
SCHIFF HARDIN, LLP
Patent Department
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606-6473
(312) 258-5779
Attorneys for Appellant
Customer No. 26574

APPENDIX A
CLAIMS INVOLVED IN THE APPEAL

1. (original) A device for feedback compensation in hearing devices, comprising:

a signal input device configured to acquire an input signal that is influenced by a feedback;

a feedback reduction device for adjustable reduction, compensation, or damping of the feedback, and

a signal output device configured to output an output signal with a reduced feedback portion; and

an estimation unit that is connected between the signal input device and the feedback reduction device, and with which an estimated value of a system distance that is defined by a distance of loop gain of the feedback system to its predetermined stability limit can be determined from the input signal, such that parameters of the feedback reduction device are controllable using the estimated value.

2. (previously presented) The device according to claim 1, wherein the estimation device is configured to detect a first signal portion and a second signal portion from the input signal, to generate an estimated signal from the first signal portion for the second signal portion utilizing a model, and to determine an estimated value from a difference of the estimated signal and the second signal portion.

3. (original) The device according to claim 2, wherein the first signal portion corresponds to a high-frequency portion of the input signal, and the second signal portion corresponds to a low-frequency portion of the input signal.

4. (original) The device according to claim 2, wherein the estimation device comprises a feature extractor configured to extract features from the first and second signal portions for further processing.

5. (original) The device according to claim 1, wherein the feedback reduction device comprises a feedback compensator.

6. (original) The device according to claim 1, wherein the feedback reduction device comprises an amplification/compression control.

7. (original) The device according to claim 1, wherein the feedback reduction device comprises at least one oscillation detector and at least one narrow-band filter device to suppress oscillations based on the estimated value.

8. (original) A method for feedback compensation in a hearing device, comprising:

acquiring an input signal that is influenced by a feedback signal;

adjustably reducing, compensating, or damping the feedback signal; and

outputting an output signal with a reduced feedback portion;

estimating a system distance that is defined by a distance of loop gain of the feedback system to its predetermined stability limit and producing an estimated value; and

controlling the reduction, compensation, or damping of the feedback signal using the estimated value.

9. (previously presented) The method according to claim 8, wherein the estimating of a system distance comprises:

detecting a first signal portion and a second signal portion of the input signal;

forming a predictive signal from the first signal portion for the second signal portion utilizing a model; and

determining the estimated value from a difference of the predictive signal and second signal portion.

10. (original) The method according to claim 9, wherein the first signal portion corresponds to a high-frequency portion of the input signal, and the second signal portion corresponds to a low-frequency portion of the input signal.

11. (original) The method according to claim 9, further comprising extracting, after the detection of the first and second signal portion, signal features for further processing from the signal portions.

12. (original) The method according to claim 8, wherein the reduction or damping of the feedback signal ensues via adaptive feedback compensation.

13. (original) The method according to claim 8, wherein the reduction or damping of the feedback signal ensues via controlling at least one of an amplification and compression.

14. (original) The method according to claim 8, wherein the reduction or damping of the feedback signal ensues via detecting an oscillation and narrow-band filtering-out of this oscillation.

APPENDIX B
EVIDENCE APPENDIX

There is no additional evidence entered and relied upon for this appeal.

APPENDIX C
RELATED PROCEEDINGS APPENDIX

There are no related proceedings associated with this appeal